

UNDERSTANDING COMMUNITIES AT THE
WILDLAND INTERFACE
TECHNICAL COMPLETION REPORT

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Final Report*

Understanding Communities at the Wildland Interface

Technical Completion Report

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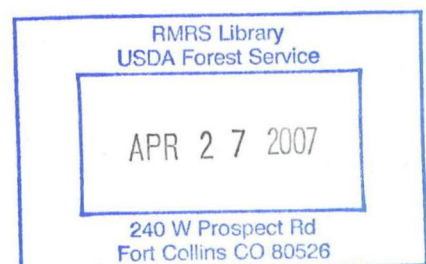


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INTRODUCTION

After a series of major wildfires in the western United States in the summer of 2000, the USDA Forest Service through the National Fire Plan began a series of investigations into the impacts of wildfires on rural community residents in areas adjacent to National Forests. Key questions revolved around the means by which Forest Service land managers could be responsive to community-level interests to protect public safety, existing infrastructure, and the host of public values surrounding fire-adapted forest ecosystems.

Through an agreement between the Rocky Mountain Research Station and the College of Forestry and Conservation at The University of Montana, a team of social scientists began to examine the state of knowledge regarding public expectations of agency decisions regarding wildfire management, especially as these decisions related to rural communities affected by recurring wildfires. Forest Service land managers expressed a willingness to adapt their behaviors to better respond to the interests and needs of rural residents, but they required a more thorough recognition of the types of public concerns, their relative importance, and the timing of effective interventions. Understanding how a community is affected and how it responds as a social system to a catastrophic environmental change like wildfire provides theoretical, substantive, and methodological insights that can be used by agencies to improve the quality of public land management.

The effort in this project was divided into three phases. First, the team of social scientists (including the authors of this report) identified a need to frame the issue of wildfire impacts on communities in a manner that could be comprehensible to both land managers and the public. Second, the team recognized that an exploratory phase of public responses to actual fires would provide an empirical grounding in the priority interests and concerns of rural residents. This phase argued for an intensive data collection effort among parties affected by recent major fires. The team spent two years interviewing a broad spectrum of citizens, managers, and fire suppression professionals that had been involved in six major fires from the years 2000-2002, and these findings helped expand and refine the nascent framework that had been under development in the first phase. The third phase intended to apply a series of social surveys to rural communities affected by fires, but because of bureaucratic barriers and resistance to the application of detailed survey instruments, the survey phase was abandoned and replaced by focus group verifications of earlier findings. This report summarizes the findings of the three phases, and it points to the other published reports that have emerged from this and similar studies. It provides a practical, user-friendly “checklist” for land managers to review in preparation for future fire events, so that the Forest Service may adapt its management to better address the complexities of the how rural communities are affected by wildfires.

RESEARCH OBJECTIVES

This project aims to provide a science-based analysis of the social impacts of wildfires to allow Forest Service managers to respond effectively to the needs and interests of people residing in fire prone settings. Via a greater understanding of the significance and consequences of decisions

relating to wildfire suppression and fuels management programs, Forest Service land managers can evaluate their actions in a systematic manner to improve future decision-making.

Specifically, this project creates:

- A framework for understanding the effects of wildfires on communities;
- A summary of the key social and institutional conditions at the level of a rural community that Forest Service staff may monitor to improve agency effectiveness and relationships with rural communities; and
- A linkage to additional research products and future work to evaluate the effectiveness of recommended monitoring protocols.

APPROACH: AN EVENT-BASED FRAMEWORK

This project uses an event based approach as a framework for understanding better interaction between managers and communities (McCool, Burchfield, Williams, and Carroll, 2006). One advantage of this approach is that it provides for a broad overview of the relationships and dynamics involved in time periods recognizable by managers and citizens alike. Fire managers then can focus on one or another element within this system without losing sight of the interconnectedness of the major periods of a fire event. Thus, this event-based approach depicts dynamics and decisions occurring in one period that may lead to consequences during other periods. Another important feature of this framework is that it is applicable to real-world management and decision making, as it identifies discretionary decisions that can have discernable consequence to communities. It is one thing to characterize wildfire dynamics as conditions beyond human control (e.g., drought cycles, cold fronts). It is another to accept these “uncontrollable” elements as givens and emphasize the impacts of decisions that can be controlled or influenced.

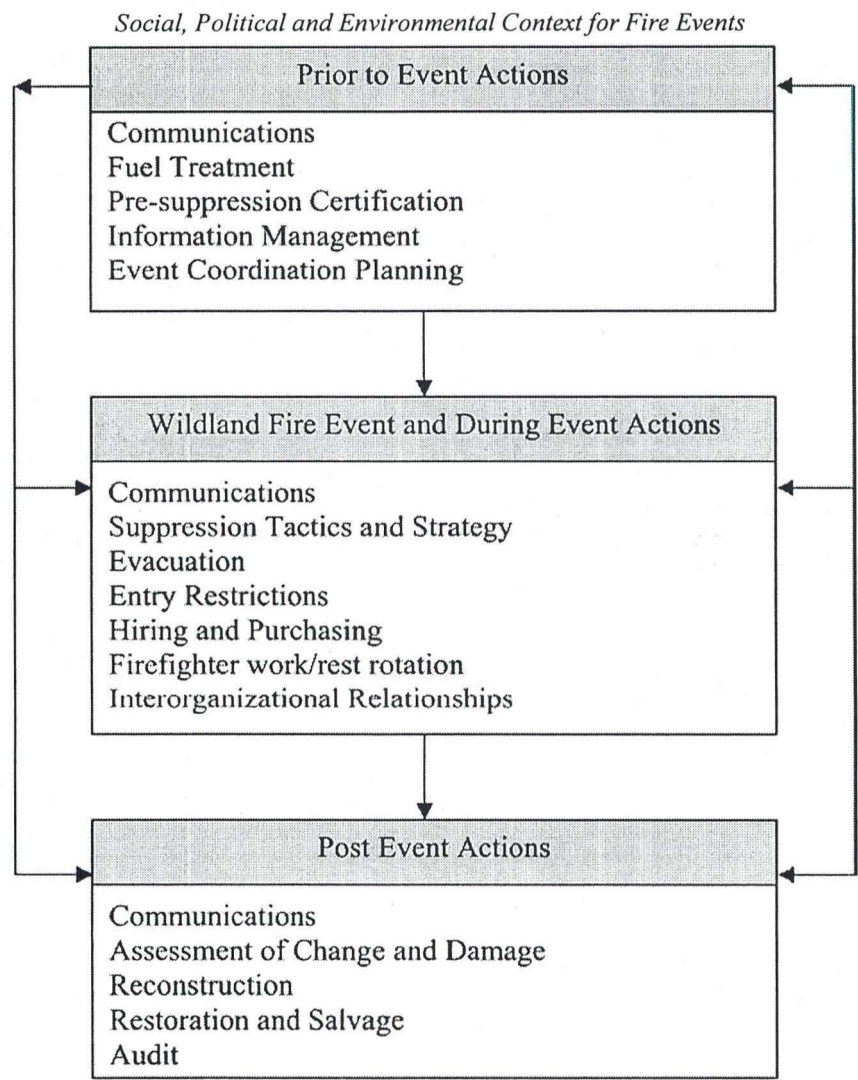
The development of the framework involved multiple, interlocking investigations that allowed for ongoing modification of the framework as data and analysis occurred. Literature reviews of the multiple impacts on communities (McCool et al. 2005) were followed by formal and informal communication with land managers and wildfire Incident Command Team participants. More importantly, the research team initiated a field-based examination of a set of rural communities affected by six major wildfires that had occurred in either the 2000 or 2002 fire season. The six fires were selected based on their intensity, geographic distribution across the western United States, and their proximity to established human settlements – both urban and ex-urban – to understand the range of impacts of wildfires on individuals, neighborhoods, and communities. Although multiple communities were affected by some of the larger fires, the communities most intensively sampled from the six fires were: Salmon, Idaho; Woodland Park, Colorado (the Hayman Fire); Show Low, Arizona (the Rodeo-Chediski Fire); Ashland, Montana; Helena, Montana, and Santaquin, Utah. In-depth interviews were conducted with between 20 and 30 individuals in each community location, applying a selective sampling strategy to acquire information from of a broad spectrum of affected interests including rural residents, fire management professionals, law enforcement personnel, and resource managers. Via content analysis of recorded interview data, patterns of key concerns and experiences among

individuals affected by wildfires emerged, allowing for a refinement of the framework and a fuller understanding of the types and timing of decisions made by the various actors engaged in wildfire events.

FRAMEWORK RESULTS

Figure 1 summarizes the major decisions occurring throughout the fire event cycle. Similar to other natural disasters, some consequences of a wildfire event can be mitigated beforehand with appropriate planning and preparation. Others can be mitigated during and after the fire. Understanding that decisions are linked helps to frame the question of assessing consequences. Processes of communication between agencies and communities emerge as important at all stages of fire events, and how such processes are implemented affects the nature, intensity, and breadth of consequences at the community level.

Figure 1: Decisions made before, during, and after the fire event influence the effects of wildland fire on communities (McCool, Burchfield, Williams, and Carroll, 2006).



Prior to Event Actions

The underlying purpose of decisions and actions before a fire event is to reduce the negative consequences of the fire and to prepare for actions during and after the fire. Preparedness decisions involve actions to prevent fire from occurring; to reduce the probable intensities of a wildland fire event; to mitigate the risk or potential harm from a fire once it starts; to allocate resources and skills for managing people, communities, and resources during a fire event; and to strengthen the capacity to recover and rehabilitate lands and communities once the fire has been controlled.

Based on our review of the literature, research experience, and comments from workshop participants, we suggest that five major decisions are made during the pre-event period: (1) decisions about the content, audience, and media needed for communicating risks of wildland fire threats and responses to them; (2) decisions about management of fuels; (3) decisions to identify and organize local firefighting support (including pre-event certification of equipment and personnel); (4) decisions about how information important to fire suppression strategy is to be managed; and (5) decisions concerning allocation and management of resources among agencies and strategies to be used should a wildland fire event occur.

Communication Decisions

Decisions about public communication, while occurring in all three phases, involve in the pre-event phase a focus on raising public awareness about wildland fire and its role in the local ecosystem; developing better understanding of the risks entailed by individuals while living, working, and recreating in the wildland–urban interface (WUI); preparing residents for evacuations if needed; understanding public concerns about and perceptions of wildland fire; and encouraging homeowners to adopt practices that will reduce the ignitability and exposure of homes to wildland fire (Cohen 1999).

Research on communications shows that the willingness of people to respond to a persuasive message is based on complex processes involving norms, peer pressures, beliefs (including perceptions of risk), and prior experience (see, for example, Fishbein and Ajzen 1975; Manfredo and others 1990; Petty and Cacioppo 1986). Yet the strongest message for building awareness of fire risk is the actual occurrence of fire, and the increasing frequency of seasonally repeated fires elevates public interest in preparedness, in much the same way that the seasonal repetition of tornados and other weather-based disasters heighten involvement (Drabek 1986). Conversely, a wildland fire event experienced in a community or neighborhood may tend to “dampen” the risk of a future event because individuals may feel that the probability of a repeat fire event is very low.

The choice of communication medium, message content, and message source will influence the consequences in terms of the major purposes of communication at this stage. Common mass communication media, such as brochures, may have little influence on individual behavior, whereas social legitimizers may have an enormous influence. Frameworks such as Rogers’ diffusion-of-innovation approach (Rogers 1995) may help fire managers to use scarce resources

more efficiently while leveraging other persuasive forces to obtain desirable results. For example, decisions that promote the implementation of visible preparedness treatments around homes in high-volume travel corridors would allow people to observe the effects of “early adopter” behaviors. Because many of these treatments for defensible space around homes can be designed to create aesthetically pleasing effects, encouraging the adoption of “fire-safe” behaviors also could take advantage of people’s desires to do more (e.g., beautify their properties) than simply reduce risks (Daniel and others 2002).

The impact of communication decisions on fire-vulnerable communities is perhaps most obvious in the breach. Negative consequences can occur when such communication does not occur or is not effectively carried out. Community “fire-safing” is less likely to occur or to be less effectively implemented in such situations than in circumstances wherein technical knowledge has been interfaced effectively with local, site-specific knowledge and experience. This sets the stage for blaming behavior after a fire event (Kumagai and others 2004a, 2004b).

Communication strategies are linked to other temporal periods and may change on the basis of the extent or intensity of wildfire occurrence or other factors such as existing community–agency relationships. The post-fire recovery stage is a particularly ripe period for reminding people of preparedness needs. In the inter-fire periods, managers must decide on the periodicity of messages, using related events such as droughts or hot weather to capture public concern. Other actions in the forest that are observable, such as timber sales, also can serve as communication vehicles for fire preparedness because slash disposal or the creation of fire breaks remind forest visitors of the fire-adapted environment. Managers will need to consider how their normal activities can create opportunities to keep a fire-safe message consistently in front of a public that is all too forgetful of inevitable periodic wildfires.

Fuel Treatment Decisions

Fire managers also must make decisions about how and where fuels will be treated to reduce fire risk. These treatments generally are based either on protecting specific structures in neighborhoods or on reducing fuel loading in forested areas of the WUI. Although fire managers cannot directly influence the actions of private forest owners, they can encourage “fire-safe” actions through demonstration, technical and financial assistance, and the development of partnerships across land ownership. Individual property owners may reduce the risk of losing structures to wildland fires by constructing defensible space immediately around these structures through treatments of common fuel problems such as overhanging trees, firewood stacks on porches, pine needles in windowsills and gutters, and other woody vegetation near or adjacent to buildings, and through the use of appropriate materials on the roof and siding of the residence (Cohen 2000). High up-front costs associated with these treatments and beliefs about the probability of a fire striking any given property are factors likely to reduce property owners’ incentives for these activities. As mentioned earlier, concerted neighborhood-based programs applying a diffusion-of-innovations framework could improve adoption of preventive measures through peer influence.

Fire managers also may desire to treat fuels in nearby forested areas. The effectiveness of fuel reduction or treatment techniques in ameliorating fire risks is subject to considerable complexity. Forest stand conditions, natural fire return intervals, fire history, drought cycles, and other factors combine to make predicting the effectiveness of fuel treatment somewhat uncertain. Recent research shows that reducing stand density in Ponderosa pine forests can lower the intensity of crown fires and improve fire suppression effectiveness (Arno and Fielder 2005; Kalabokidis and Omi 1998). This finding is particularly important given the dominance of such forests in the WUI. However, the ability to treat fuels effectively across broad landscapes is hampered by multiple issues including the extent of the treatment area, costs, competing land use objectives, and the dynamics of the vegetation itself (Pyne and others 1996). Further, research on the potential for either economic or ecological success from fuel treatments is woefully underdeveloped, and there are critical needs for more explicit production functions to evaluate outcomes (Hesseln 2000). Critical breakdowns in these processes lead to the same types of consequences for communities noted in the preceding section.

The connection of fuel reduction treatments to other fire management decisions at later times becomes particularly salient when maintenance of low fuel conditions is considered. Fuel reduction is not a one-time event, especially in the common dry pine forests of the WUI, where grasses and other highly ignitable fuels can become more prominent after thinning. Forest managers must be prepared to follow up their fuel treatment decisions in much the same way that individual landowners need to sustain vigilant care in keeping fuels away from their houses and other structures. Forecasting expenses and labor for ongoing operations will be a part of any fuel treatment decision.

Pre Suppression Certification Decisions

Fire suppression professionals are well established within land management agency hierarchies in the United States. However, during extended periods of multiple large-scale fires, agency professional resources alone are simply inadequate for suppression activities and associated support services. For example, a large scale fire may require everything from bulldozers to pickup trucks, from portable toilets to mobile command centers. Much of the needed supply, support personnel, and materiel must be acquired on short notice, and must be of acceptable quality to ensure safety. Currently, procedures to incorporate available resources at the community level are confusing to local entrepreneurs, and in cases of both suppression and prescribed fire, community representatives may be excluded from participating in fire operations because they lack recognized qualifications. Although this has long been an issue of contention between local entities and federal land managers in some areas, its salience is growing as fire complexity and scale increase, and as a greater proportion of wildland fires occur in and around human settlements (Carroll and others 2000, 2005; Kumugai and others 2004a, 2004b).

Advance planning will be necessary to discover, train, and certify key occupational groups, such as heavy equipment operators, to create greater efficiencies; to take advantage of local site-specific knowledge; and to ease developing tensions between locally available private providers and externally contracted services. Inventories will need to be available for widespread access, and decisions on call-up priorities will need to be communicated to local suppliers so perceptions

of preference are minimized in the heat of an emergency. Again, the impact of decisions about certifying local equipment is particularly obvious “in the breach.” The studies noted in the preceding paragraph have captured the frustration of local actors (in some cases, even ground-level federal fire managers) about large, destructive fires that “could have been caught” if local action had been taken in the early stages, thus preventing all the later impacts of a large fire event. On the other hand, it also is important to point out that the vast majority of small fires are caught while they are still small, and that the liability issues associated with allowing non-certified personnel and equipment onto federal lands are very significant.

Certification decisions also link to the management responsibilities during an event and after the fire has been successfully suppressed. Much emergency post fire rehabilitation requires equipment and qualified operators, and best management practices can be more efficiently incorporated into rehabilitation practices if operators who are disturbing soil and vegetation during suppression (such as bulldozer-created fire breaks) recognize subsequent requirements for rehabilitation.

Information Management Decisions

The availability of current, high-quality data on fire and fuel conditions can greatly affect suppression operations and subsequent decisions on evacuations or the allocation of scarce resources to protect communities. With the advent of geospatial information in support of fire event management, greater efficiencies in fire behavior predictions and priority areas for suppression have emerged. However, problems with data quality, infrastructure, and the training of geospatial analysts have impaired the widespread, effective use of this technology (Burchfield and others 2002). In many rural communities, information on structures and road systems is incomplete or stored in such ways as to be incompatible with fire suppression software, hampering the effectiveness of suppression operations. Incomplete data sets on fuel conditions hinder the creation of necessary wildland fire situation assessments that allow decision makers to evaluate the risk associated with wildland “use” or “let-burn” fire decisions. The manner in which information is accessed, applied, and archived can be critical to the development and application of preparatory measures for wildland fires and will hold consequences for communities similar to those noted in the preceding three sections.

Event Coordination Decisions

Federal land management agencies generally work with community-based institutions to prepare for a wildland fire event. Thus, the character of existing agency–community relationships serves as a context for more specific decisions oriented around coordination. The ability of rural fire departments and privately held resources to address suppression needs depends largely on their prior training and integration into fire suppression strategies and the willingness of firefighting teams to take advantage of their local site-specific knowledge. Decisions about what equipment and personnel are responsible for what land areas are important coordination decisions.

Land management agencies typically hold responsibility for the initial attack on forest and range fires, whereas local fire departments are structure oriented. However, often in a large-scale, complex, rapidly moving fire, such divisions of responsibility become confused as firefighters are faced with difficult choices. Does a federal team with an engine ignore a home whose roof has just caught fire in order to use their pumper on forest fuels nearby? Can homes and businesses be “triaged” before a fire event? Should local, volunteer fire departments, when under a federal command system, be allowed into areas they have traditionally protected?

Regardless of the setting, local organizations and businesses have always provided critical resources to fire suppression efforts such as law enforcement and public safety assistance from local sheriff departments, local public school facilities for command centers and fire camps, or grocery stores for supplemental food supplies. In addition, the emergency nature of fire events engenders a sense of purpose and commitment for local institutions, such that local people display strong desires and expectations for participation in suppression efforts. Sorting out the roles and technical details (e.g., emergency services radio frequencies, location of and access to tool caches, or evacuation routes) before a wildland fire event is an important coordination process that ideally occurs before an event.

The local impacts of event coordination (or lack thereof) are difficult to overstate. A major wildfire is an inherently disordering experience in the life of a community, often highly disruptive of daily routines, place attachments, and internal and external community relationships. Coordination decisions made in advance that bring together local knowledge and the expertise of non-local experts not only can lead to a more effective response to the physical event itself (perhaps even saving lives), but also may reduce the sense of disorder that community residents feel at the time of the event (Carroll and others 2000, 2005; Kumugai and others 2004a, 2004b). Many of the retrospective objections registered by local people about how a fire was handled center on a lack of coordination during the event. Thus, effective event coordination before an event appears to be a key to minimizing the fragmenting influence of major fire events during and after their occurrence.

During Event Actions

A large-scale fire event in the WUI involves residents, homeowner associations, and a number of organizations and agencies including suppression teams and their leadership, law enforcement officers (potentially from different governments at varying levels), emergency management officials, and disaster non-government organizations (e.g., Red Cross, Salvation Army, local organizations). The coordination and cooperation of these varying agencies may have dramatic effects on the impact that the fire actually has on a community. Whereas many consequences of a wildland fire event are immediate, such as destruction of homes, others such as health effects from long-term exposure to smoke may emerge much later. Unlike most catastrophic events (e.g., earthquakes, tornados), wildland fire often involves a protracted period, from a few days to several months, in which authorities attempt to manage, mitigate, and control the extent of damage. On the basis of our literature review (McCool and others 2005), research experience, and comments from workshop participants, we suggest seven decisions that can potentially have an impact on the local community in the vicinity of the fire.

Communication Decisions

As in the pre-event period, communications during a wildland fire are critical to minimizing its negative consequences. In this stage, however, communication with the public plays different roles than in the pre event period. The primary purposes of communications during the fire are to describe the fire event (size, scope, severity, rate of spread, and location), inform the public of risks and potential consequences, and prepare them for any needed action; to update affected individuals on entry restrictions, evacuations, damages, and suppression actions; to inform people who have been affected about the availability and location of shelters as well as mental and physical health services; to develop a better understanding of public concerns and issues resulting from other during-event decisions; and to direct public inquiry on how to contact appropriate recovery program agencies.

Over the years, federal firefighting agencies such as the Forest Service have developed sophisticated communication strategies with the goal of ensuring that information about the fire flows smoothly between firefighters on the front lines, fire managers overseeing the operation, public affairs specialists monitoring the effort, and those (the public and the media) whose cooperation is crucial to a safe outcome. In large-scale fires, this becomes increasingly challenging because the “fog of war” means that some things may occasionally be overlooked. In some instances, owners of destroyed homes have found out about it through television media reports rather than by official sources.

As in a pre fire situation, agencies make decisions about what to communicate to whom, when and how. A number of issues in this regard are significant. For example, information content and timing may affect residents in different ways. Fire managers may emphasize some types of information (e.g., fire behavior) over other kinds of information (e.g., the need for cooperation and calm or a listing of destroyed homes) at different points in a fire event. As a fire event develops, there may be needs for some types of information over other types. Fire managers will need to know what media are best for what types of information. For example, the use of local electronic media may help displaced residents better understand what areas have burned, whereas regional and national media build awareness of the fire to others. Use of Web sites has become increasingly frequent, but to be useful, updates may have to be done several times a day.

Whereas considerable literature on crisis communication exists (see Coombs 1999), research on the effects and effectiveness of fire-related communications in relation to communities is only starting to emerge. Taylor and others (2005) studying communications during the 2003 southern California fires found that official communications tended to focus on what was salient to fire managers but not necessarily important to community residents. They recommend that fire managers find ways to monitor the often rapidly changing information needs of communities.

Another related problem is maintaining consistency of information management over the course of a large fire as the information management teams rotate in and out of the scene. This further slows down the flow of critical information. In addition, successful communications during a fire are partly the result of effective community collaboration in the pre fire planning phase and

facilitate the community coming together to address post fire recovery phase efforts (Burns and others 2004).

Suppression Tactics and Strategy

Depending on the size of the fire and other ambient conditions, the administration of individual wildland fires is assigned to suppression teams according to established interagency protocols. Decisions are made that involve the basic strategies of fire suppression (e.g., containment vs. property protection, what flanks and fronts to attack and how) and a host of tactical questions such as the use of backfires, the types of equipment used (aerial, ground), and the type and source of personnel (agency vs. local) involved. In addition to basic strategies and tactics, there are important dimensions of attack timing and location that have an impact on communities and particular neighborhoods and residences. The many strategic and tactical decisions involved in managing a large wildland fire open the door for communities to question the decisions of the fire suppression team, particularly when life and property are affected. Thus, although firefighters are often praised for their valiant efforts to protect local property, considerable controversy can develop over how the fire was managed and over policy factors that contributed to the fire in the first place (Carroll and others 2005; Rodriguez and others 2003).

For example, Carroll and others (2000, 2005), Graham and others (2003), Kumagai (2001), Kumagai (2004a, 2004b), and Rodriguez and others (2003) all have reported local–federal conflict over federal forest firefighting, and over relationships between federal forest firefighters and local entities. The issues have revolved generally around aggressiveness of firefighting, protection of homes, priorities for resources and structures to be protected, and the extent to which local personnel, knowledge, and resources were used in fighting fires. Although no focused research on such conflict has been conducted, the underlying reasons appear to be complex and multifaceted. They seem to range from faulty causal attribution by fire victims (see later), to the confusion of activities inherent in large fires similar to the “fog of war,” to a focus on the “big picture” of a fire versus a place-specific view, to differences in culture between large government agencies and local communities, to genuine differences in values and priorities vis-a`-vis how to fight fires and what level of risk to firefighters should be tolerated to protect homes and property (Carroll and others 2005; Cortner and Gale 1990).

Evacuation Decisions

The mandatory movement of residents and businesses threatened by wildland fire and the various aspects of notification of possible evacuation are likely to be among the most disruptive aspects of a catastrophic wildland fire for a community. Dimensions of evacuation decisions include how much time people have to prepare for evacuation, opportunities for evacuees to gather their most precious possessions, the presence of pets and livestock, and whether the locations of friends and family members are known. Understanding how evacuation decisions are made and communicated to those affected is important, as is identification of specific potential evacuees. The number of households and businesses affected and the lengths of time involved hold important implications for the size of evacuation consequences.

Evacuation may be a traumatic and dangerous process itself, and the very act potentially leads to impacts on individuals (Carroll and others 2005; Drabek 1994; Perry 1994). It occurs at a time of high anxiety and uncertainty about many questions. Will my home burn? Will I lose all my possessions? Is there enough time to evacuate safely? Are my children safe? How can I be sure my dog is safe?

A better understanding of evacuation and impacts would help to mitigate the impacts of evacuation actions and potentially improve relationships between the community and public safety institutions. Here the disaster literature would be helpful in informing fire and emergency managers during the pre-event phase of procedures and expectations during the fire event.

Entry Restrictions

Entry restrictions often are necessary to reduce risks not only to local residents, but also to others who may be visiting forest areas for recreation or business purposes. Such restrictions also may be necessary to reduce congestion and barriers to the efficient movement of emergency vehicles, aircraft, and personnel. The impact of these restrictions may range from inconvenient disruptions of daily life to serious interruption of business activity. These restrictions must be enforced by local public safety personnel or by hired security personnel. The efficacy of handling these tasks is a major question, as is the issue of how access is determined during a closure. Managers are necessarily risk averse, so an explication of the criteria used in determining areas to be closed is important.

Hiring and Purchasing Decisions

Fire suppression requires equipment, people, supplies, lodging, food, portable toilets, and other goods and services. Such hiring and purchases can potentially result in significant local impacts. Although we often think of wildland fires as having negative impacts on local economic activity, one potential positive impact of the fire suppression effort is the generation of economic activity in the local community related to firefighting. It is important to point out, however, that these impacts are likely to redistribute economic activity in ways different from those in the “normal” situation. Some business, such as recreational outfitting, may come to a complete halt, whereas other business, such as lodging, may do booming business accommodating not only firefighters, but also media personnel and evacuees (Butry and others 2001). With respect to social impact, how purchasing and hiring decisions are made and whether there are ways to do this that are minimally disruptive and that reduce the negative distributional impacts remain important questions. In some cases, it may not just be who was hired and what was purchased, but also the very determination of the needs for this hiring or purchasing.

Carroll and others (2000, 2005) and Graham and others (2003) all have reported that specific business sectors suffered disproportional impacts from fire events. Among these were seasonal businesses, businesses with perishable stock such as local nurseries, and businesses that relied on seasonal tourist dollars. Short term income and job losses from the Rodeo Chediski (Arizona)

and Hayman (Colorado) fires that affected families appeared to be heaviest among those with seasonal or temporary employment and business owners whose busy season is the warm weather months. Similar impacts were reported from the Wenatchee National Forest (Washington) fires in 1994. Purchasing and hiring decisions by fire managers may help to ameliorate these impacts or may end up aggravating them.

Firefighter Work–Rest Rotation Decisions

The presence of firefighting personnel in a community setting brings new resources and disruptions to the daily life patterns of local residents. During long fire suppression efforts, the scores of firefighting personnel and other people involved (e.g., media personnel) begin to have a presence in the community. They purchase supplies, eat out at restaurants, take in a movie, and engage in other non–fire-related activities in and around the community. These activities not only have an obvious economic impact, but also potentially create a “behavioral” presence that may produce positive or negative interactions with community residents (e.g., competition between firefighters and locals for services). How firefighters behave in public may leave an important and lasting impression on community residents.

Inter-Organizational Relations Decisions

This large and complex task of managing inter-organizational relations occurs in the midst of a crisis that usually cuts across governance scales. A large fire requires coordinating the activities of varied autonomous groups (multiple firefighting organizations, media, local emergency personnel, aid organizations) with different constituencies to which one must answer. This task may be among the most important for the success of the overall effort. Fire suppression agencies from different jurisdictions at different levels of government having varying experiences with wildland fire and structural fires will have to coordinate and determine appropriate roles and potential triage policy (e.g., are homes with no defensible space protected or allowed to burn?). As indicated earlier, success with the task and the consequences to the community are highly dependent on preparations made in the pre fire stage (Burns and others 2004). Research on organizational relationships and the types of organizations involved would help responsible agencies to understand the issues that arise in the development and implementation of coordination strategies, the response to these issues, and how these responses might affect preparedness decisions.

Post Event Actions

After control of a fire event, five major decisions affect communities: communications, assessment of change and damage, reconstruction of damaged infrastructure, restoration of desired resource conditions, and auditing of the level of change. Post fire decisions are closely linked to the decisions occurring before new events because they offer the greatest opportunity to capture public attention for necessary mitigation of future potential damage and risk.

Communication Decisions

The need for communications with the public does not end once the fire has been suppressed. In this stage, communications might focus on creating an understanding of the breadth and intensity of impacts to both the biophysical and social domains; communicating needs for salvage, restoration, repair, and reconstruction; developing a sense that the fire event provides lessons on preparation for similar future events; identifying potential new hazards such as floods and mud slides resulting from the fire; and developing strategies to engage the public in more interactive approaches for a better understanding of community responses to the fire event and the acceptability of restoration strategies, and to lay foundations for future pre fire event planning.

Communication decisions after a fire must consider the trauma suffered by many residents. The use of community-level organizations to help describe recovery efforts and address specialized needs during the post fire period can offer a legitimacy and sensitivity necessary for effective actions (Halverson 2000). Agency staff will need to focus particular attention on the clarity of communication and explication of decision processes used during the fire and in the recovery period to guide the healing process for the communities (Daniels and others 1996; Duncan 1997). The linkage of communication processes in this phase to desirable mitigation of future events cannot be overstated because the receptivity of the audience to messages of preparedness for future events is at its highest (Drabek 1986; Passerini 2000).

Assessment

Assessment involves identifying and inventorying the damages and changes resulting from the wildland fire event itself. This would include mapping tree damage and mortality, soil and watershed impacts, erosion potential, and the risks of flash floods and mud flows. In addition, the assessment would include damages done to personal, community, and government property and infrastructure. Assessment also would include the state of the community's "mental health," and actions needed to deal with it. The assessment and how it is done are critical not only to developing estimates of the magnitude and scale of impacts, but also to identifying any distributional impacts to the community. The assessment lays the foundation for reconstruction, restoration, and salvage decisions.

Assessment decisions create complex linkages to other future actions as they lay the groundwork for longer-term rehabilitation. Immediate post fire assessments typically are performed quickly to ameliorate potentially dangerous mud slides or other erosive mass failures, but they do not address the other complex recovery efforts such as salvage operations, reconstruction of transportation systems, and rehabilitation of forests. These assessments can be bogged down by procedural requirements for disclosure of environmental impacts, and opportunities to accomplish timely work can be lost. Managers will need to prioritize the cost-benefits of delaying more complex assessments and choose a flexible, articulated style of assessment based on specific resource deterioration-recovery cycles. For example, some types of salvage may need to be done relatively quickly to protect the public (e.g., from falling trees) or to capture wood volume before predictable decay. This flexible assessment strategy would need to be considered even before a fire event so that existing staff capabilities can be marshaled quickly

for assessment tasks. Managers may use varying intensities of assessments to make time-sensitive decisions without compromising long-term environmental health.

Reconstruction and Repair

Homes, businesses, civic facilities and transportation systems, and other community infrastructure may have been damaged or destroyed by the fire. This set of decisions identifies what structures and other infrastructure needs should be addressed, how these should be prioritized, how reconstruction should be financed, and how emergency funds should be distributed. It also involves processes of claims and payments, and in some cases introduces new organizations such as the U.S. Federal Emergency Management Agency (FEMA) into the situation. One dilemma is that residents whose houses were saved may no longer wish to live in a landscape that now has been dramatically altered (Carroll and others 2005; Graham and others 2003). Another is concern about damage to municipal water supplies from high-intensity fires (Graham and others 2003).

Much like the assessment strategy, a reconstruction and repair strategy would need to be in place even before a fire event to allow for timely action. Water systems and other vital services such as electricity need to be restored quickly, and the significance of available, certified personnel to accomplish emergency work applies in the post fire period as much as it does in the pre fire period. The burden of being homeless only increases as time progresses, and businesses are not successful if they are shut down for extended periods. Thus, coordination decisions with other agencies such as FEMA need to be well established before a fire event to make sure that post fire events do not exacerbate an already traumatic situation.

Restoration and Rehabilitation Decisions

Natural resources (e.g., vegetation, habitats, landscapes) may have been severely impacted. The probability of flooding and erosion with additional damage to infrastructure may be high. As the size and intensity of wildland fires have accelerated, so has the need for activities that rehabilitate and stabilize natural environments. Decisions on these actions may involve community members, not only because they tend to be labor intensive, but also because many actions may be needed in the private lands of the WUI. Because restoration and rehabilitation projects for watersheds can be quite complex and expensive (with a high potential to create new problems), the aforementioned assessment decisions are vital to the efficient and effective allocation of scarce restoration resources.

Restoration and rehabilitation decisions are strongly tied to both past and future events. It might not only be a wildfire that has altered the ecosystem. Prior management activities may have been underlying causes for large-scale restoration needs (ironically, the suppression of fire is one of the most commonly cited causes for restoration). The scale of restoration is an important element in any restoration decision, not only because of the cost of these actions, but also because of the uncertainty in recreating integrated, functional ecosystem conditions. Restoration also unearths other latent management controversies, such as debates about the benefits of transportation

systems or timber harvesting patterns, that cannot be addressed outside the context of long-term management goals. Again, the link to prior decisions is important because landscape planners are able to map zones in which a fire disturbance could be beneficial within a landscape mosaic, and these areas would receive different types of attention both during and after a fire to restore more natural fire-adapted conditions.

Salvage Decisions

The commodities within affected lands, such as burned trees, still may be usable in an economic sense, and there often is great political pressure to salvage such values to serve utilitarian needs. Salvage operations have become increasingly controversial because some groups feel that timber salvage operations have become just another excuse for logging in areas where no logging should occur, whereas others see not salvaging as an unconscionable waste of useful natural resources. Burned area salvage often is a component of post fire recovery plans, yet these salvage decisions can best occur in advance of the fire event as part of broader restoration strategies so they do not become touchstones for larger debates about the efficacy of timber operations. Whereas the fire event may have worked to encourage cohesiveness among community members, salvage proposals tend to be contentious and divisive because of the need for timely action and the potential for soils or watersheds to be damaged in the wake of a fire. Determining the scale of salvage operations can be a difficult decision for managers, and without considerable forethought concerning overall restoration objectives at a larger landscape scale, it is difficult to develop a rational approach to salvage simply by observing the area of burned trees.

Auditing

The “final” set of decisions involves appraisal of the fire event and the decisions before, during, and after it. The purpose of a fire audit is to examine these decisions, to learn from them, and then to recommend needed changes in fire policy, prevention and preparedness, suppression (and the accompanying activities), and post fire actions. For example, the audit could address the effectiveness of preparedness actions, the efficiency of differing communication strategies and tactics, and problems encountered in salvage and repair actions. The information from the audit can be used to determine what changes are needed both in the pre fire setting and during the event to mitigate effects.

The actions taken to suppress and control the fire, any evacuations or entry restrictions that were emplaced, the flow of information to communities as well as individuals, and interagency cooperation and coordination are documented and evaluated to learn what happened and why. This now is done more formally as an after action review (The Wildland Fire Lessons Learned Center 2003). The after action review has as its focus learning lessons that then can be applied to future fire events. This assessment typically is conducted as a technical procedure focused on suppression and control, but, increasingly, as the intensity and scale of fires has increased, there has been more interest in implementing a broader and more inclusive assessment process.

The involvement of the community and its agencies in debriefing and assessment of the fire and associated activities needs to become an increasingly important component of such assessments. An effective framework for community recovery, which would include issues such as restoration of utilities as well as financial and technical assistance to businesses, homeowners, and governments needs to be holistic (Monday 2002). Importantly, assessment decisions provide information that may lead ultimately to reinforcing or changing the ways that agencies make decisions in both the pre fire and during-fire periods, thus providing the feedback necessary.

VERIFICATION OF THE FRAMEWORK

An objective of this research is the provision of a summary of conditions and processes that can be monitored by Forest Service field staff to improve agency effectiveness in their joint responsibilities with communities to manage wildfire events. The event-based framework described above identifies key decisions before, during, and after a fire, but it could be assisted by an evaluation of the relative importance of these various decisions. Since the research team was unable to conduct social surveys to assess priorities across the general populations of the six communities affected by fires, the team decided to utilize a structured prioritization exercise, the nominal group technique, among an assembled group of fire managers, citizens, and rural community advocates.

Nominal Group Input

The researchers participated in the 2006 National Wildland/Urban Interface Fire Education Conference - Backyards and Beyond, held in Denver, Colorado from November 2-4, 2006. In a special session on Lessons on Community Impacts from Wildfire, they presented an overview of this project and asked for help from fellow participants in the workshop to evaluate the importance of decisions and actions taken by local communities and land management agencies during wildfires.

Conference participants that attended the session on Lessons on Community Impacts from Wildfire were first presented with some of the background of this research and were then asked to participate in a nominal group exercise to generate ideas for further consideration as points in an overall process for managers to work with local communities to mitigate wildfire impacts. The participants were divided into four groups of about six each with each group being facilitated by one of the researchers. The four groups each developed independent lists of considerations and then each participant had three votes to distribute among their list to represent the most important ideas. Each participant could distribute their votes within their group's list any way they chose, including placing all three votes on the same item or distributing them across different items. The results of this process were then combined into one table that rank orders all items that received votes from the participants in all four groups. Table 1 below presents the combined suggestions from this process, with items receiving the most votes listed first.

Table One: Considerations generated from a nominal group process and rank ordered by perceived importance.

Votes	Statement
8	Emphasize personal responsibility - self-preparedness, water, comm., Firewise, I/S
6	A time table for event audit (EA)
	EA includes:
	<i>Assigning responsibility for audit at the local level.</i>
	<i>Promoting successes of mitigation</i>
	<i>Documenting effectiveness of fuels treatments on fire behavior.</i>
	<i>Prepare for the next event</i>
	<i>How do we monitor what we saved rather than what we lost?</i>
5	Assess single largest problem we had during fire - through audit of the operational aspects of the fire. Hand over to the next team that takes over that addresses the community context. Operational, formal critique, all the players in meeting or two. Evacuation ok? Communication ok?
4	Changing dynamics at community and neighborhood level.
4	Multi agency planning and training (pre)
4	Education on the role of Fire (pre)
4	Understand who key stakeholders are in the community before the event.
3	Status of fire - updates about fire information. How or if it's done.
3	After the fire - no guilt or no regret, affected by education
3	Good communications among agencies (pre, dur)
3	During fire work with local resources public/private entities. Post fire work with locals on availability/sources of funding rehab, etc.
3	Public info (B, D, and A)
3	Identify treatment locations across all ownerships.
3	Sources of aid for recovery after the event

Table One: Continued...

Votes	Statement
2	Database storage system and responsible person for archieving firewise treatments. (along with areas treated in the forest that have substantially reduced fuels.
2	Compatability of fire management goals with community goals. Community sees the forest as an unchanging sea of green that should not be harvested. Manage for green and harvest? No concensus on the role of fire. Do they look at the science? Is this a values conflict?
2	Fire risk - spatial analysis (pre)
2	Revise emergency planning measures to improve.
2	Economic impact of fire to community (post)
2	Interagency fire management plan
2	Educate the media. Agency capability, personal responsibility. Don't post \$\$ amount spent on Inciweb. Focus on positive info, some info isn't necessary.
2	Taking advantage of teachable moments.
1	Based on individual hypothesis - what action do I take? Fuel reduction; emergency planning; housekeeping, years, months
1	Map of roads that show bottlenecks during high volume - can call in the police and DOT, other evacuation routes, data gaps?, getting resouces in on shared roads.
1	Knowledge of (operating hypothesis) preconceived expectations of what will happen in a fire - "anticipated regret"
1	Is the issue listening network in place? - operational, able to respond to problems during a fire.
1	Information on evacuation status ongoing and relief resources available - are these plans working?
1	Is there an emergency measures plan (pre)
1	Location of all firewise treatments (pre)
1	Know the type of firefighters available (pre)
1	Communications to the community as to where, when, how ... (dur)
1	The importance of local expertise (dur)
1	Community debrief (post)
1	Pre and post action plan regarding micro/macro level. Done by FO, triage, what to expect: things that are critical for people who live there.
1	What is there after fire - what to expect, or community impact. Access to mental health res., psych. Keep liaisons around after fire (From IC team) or a way to contact them. PI continuity.
1	Inventory of housing unit risk
1	Community's input into desire level of protection and the trade-offs.
1	Education of recent arrivals.
1	Periodic audit of mitagion plans and actions.

It is useful to note that workshop participants identified personal responsibility in preparing for a wildfire event as a top priority for communities to mitigate the potential consequences of wildfire events. Even though local land management agencies like the Forest Service have important

roles to play in providing tools and information to rural residents to prepare for wildfires, the burden for manifesting change remains on the shoulders of the residents themselves.

Workshop participants also rated highly the practice of post-fire auditing to recognize the effectiveness of earlier actions such as Firewise or fuel treatments. This emphasis on a thorough and incisive critique of pre- and during-fire effectiveness supports the central assumptions of the framework and this research project in general: there can be substantial gains made in mitigating fire impacts by organizing monitoring and evaluation efforts across the time spectrum of fire events. By paying close attention to a broad spectrum of community/agency practices and how they functioned during and after a fire, actors at the field level can make adjustments and be far better prepared for the inevitable subsequent wildfire in their vicinity. The organization and storage of this auditing information also emerged as a responsibility to be addressed, although neither the framework nor the workshop results offer any direct guidance on how or where auditing or assessment data should be housed.

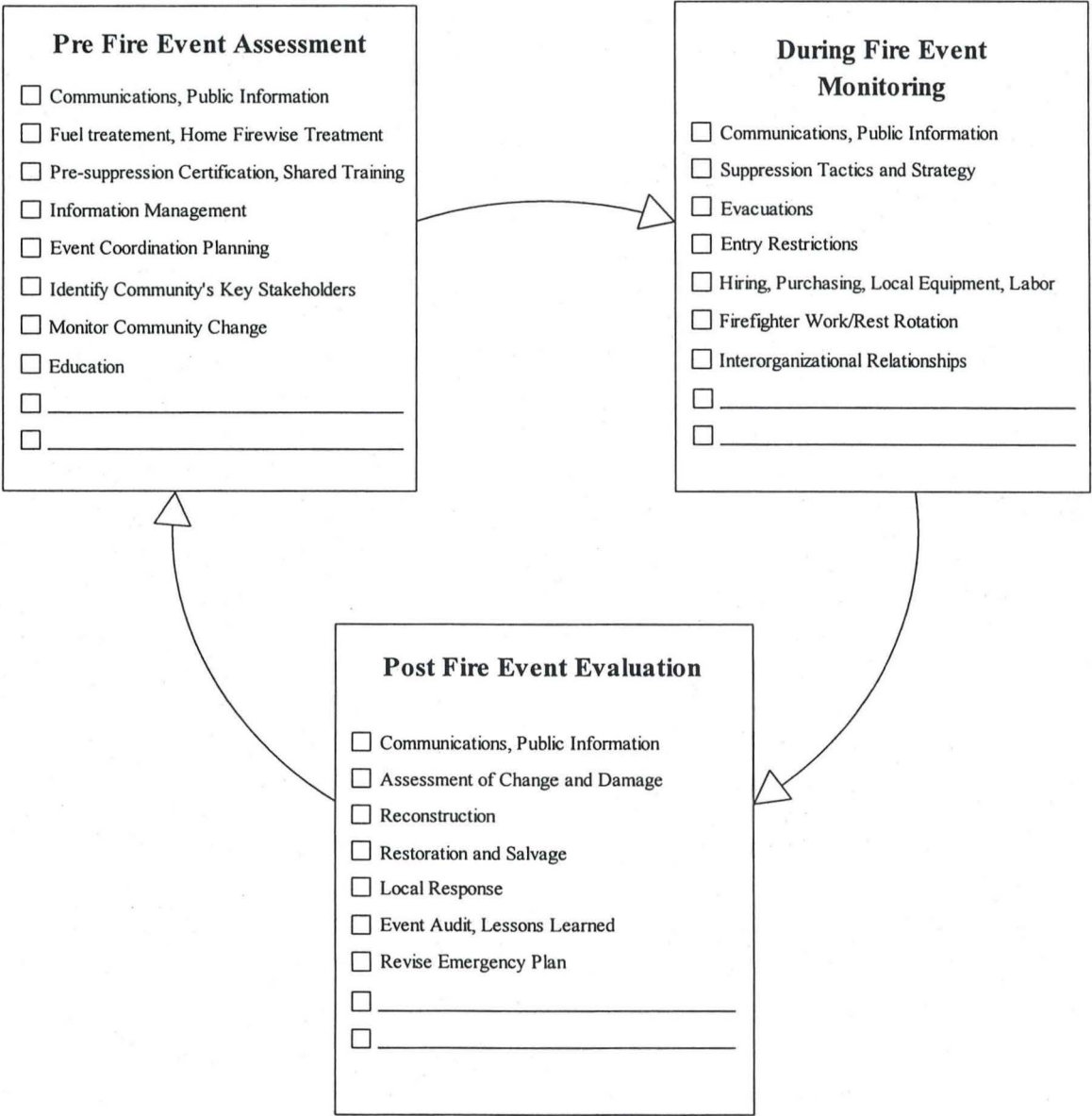
Major elements in the framework that are repeated across time periods in wildfire events, such as understanding communication networks and coordination mechanisms, were also supported by the results of the nominal group process at the workshop. Pre-fire communication was identified by workshop participants as more of an educational task than a mechanism for distributing information, which may imply a broader set of associations between the Forest Service and other educational outlets, such as public schools. An additional insight from the workshop was the priority given to understanding the changing dynamics of housing and land use at the community and neighborhood level. Although the Forest Service has long sustained data on forest conditions and infrastructure on National Forests, the acceleration of rural development on the forest fringe places new burdens on the agency to address cross-boundary impacts. Planning for forest operations, such as fuel treatments, can no longer be conducted in isolation from the larger context of community-level infrastructure and its critical attributes such as water use and transportation. Inter-agency coordination for fire events in both planning and operations will become more vital in the future as more people and larger scale investments alter forest ecosystem conditions on both public and private lands.

A TOOL FOR IMPROVING ADAPTIVE EFFECTIVENESS: A FIRE EVENT CHECKLIST

Input obtained from participants in the nominal group exercise were combined with the original guidelines identified by the researchers to provide a more complete set of considerations for managers to evaluate the effectiveness of planning with local communities. A series of monitoring checklists were developed and are presented in the appendix of this report to guide managers through an evaluation process during the three stages of a fire event. In an effort to make an assessment of conditions and processes for monitoring as straightforward as possible, the checklists are formatted as a series of questions with blank spaces below questions for responses or relevant commentaries. Managers can utilize the checklists in conjunction with other community level organizations – such as rural fire districts – to recognize whether or not their respective units have considered the elements that could be important for adapting community infrastructure and procedures to address wildfire risks. Depending upon local conditions, not all items in the checklists may apply to the specific situation of a Forest Service field unit. Similarly, there might be additional considerations that managers might wish to add to

their checklists to address their specific needs or interests. Figure 2 illustrates how the three monitoring checklists correspond to pre, during, and post fire periods. The figure also illustrates some of the main considerations that are included in each checklist while recognizing the ongoing, cyclic nature of fire event planning.

Figure 2: Using an event based approach to examining the decisions about wildland fire and human communities can involve a series of checklists of relevant considerations and actions.



Use of the checklist will be at the discretion of individual land managers and their fire management officers, based on existing relationships and the status of other important tools, such as Community Wildfire Protection Plans (CWPP). The checklist is not intended to be an oversight mechanism with attached accountability requirements, but simply a device to allow full consideration of potential agency decisions that allow for improved relationships with communities and mutually beneficial actions to help communities adapt to wildfire events.

CONCLUSION

The framework presented in this discussion provides a relatively straightforward heuristic device for recognizing and observing the multiple interlinked actions and consequences associated with wildland fire. Even if actions result in unanticipated outcomes, factors that will need to be addressed in future events can be considered. The framework and the associated checklists also provide an agenda for framing research questions, examining results, and identifying information gaps needing further study. If there can be greater systematic attention to both the conditions and processes that affect communities experiencing wildland fire, then these events that are bound to arise can be accommodated with less anxiety, expense, and uncertainty.

The authors recognize the complexity and expense associated with comprehensive monitoring and evaluation programs and are sympathetic to the multiple burdens and responsibilities faced by managers in a period of constricting budgets. The checklists are thus designed to be adapted to local conditions and open to modification. However, the questions posed in each of the checklists can stimulate, at a minimum, recognition of information or coordination needs that might need to be addressed. Other partners or supporters at the community level may be able to take on specific tasks that can bolster assessments or information delivery, and the act of inviting other community-level organizations to participate in monitoring efforts may lead to new ideas and cooperative strategies for addressing fire events. The ability of Forest Service managers to incorporate a systematic set of procedures to involve communities in preparations for wildfires may even lead to a greater public understanding of the role of the National Forests in rural locations, and may ultimately contribute to more holistic, efficient management of forest lands across ownerships.

Additional Research

Beginning in the spring of 2007, additional work is planned to review the framework and the checklist with on-the-ground managers to identify its potential application. Groups of managers will be assembled in Region 1 of the Forest Service to review the checklist contents and to consider its applicability. Members of the science team will generate individual questionnaires for participating managers to evaluate these checklists, and they will also conduct a facilitated group discussion of the strengths and weaknesses of the checklist approach. Via this critique by potential users, modifications can be made to create a monitoring tool that can be easily utilized and incorporated into programs and monitoring protocols currently in use.

FIRE

EVENT BASED

MONITORING WORKSHEETS

Pre Fire Event Assessment

☐ Pre Fire Communications and Public Information Worksheet

- What community centers are available to house bulletin boards or maps of fires during a fire event?
- What radio or TV stations are capable of broadcasting accurate fire information?
- What is the capability of local fire fighting agencies or Forest Service staff to create and maintain a fire event web page?
- What is the relationship to local newspaper reporters or other key distributors of information in the community?
- How do we let people know about these sources before fire season starts?
- What information is important to residents?
- What real-time GIS/mapping capabilities are available? OH, and what about after the event, how do we let people know what's going on with rehab, salvage, etc.?
- Is there good communications among agencies?
- Is there community input on desired level of protection and the trade-offs?
- What are common outlets for information?
- What is the capacity for broadcasting and supplying information?
- What is the access to street level information?

Pre Fire Event Assessment

☐ Pre Fire Fuel Treatment and Home Firewise Treatment Worksheet

- What types of incentives are available to landowners for adopting fuel treatments (insurance premium rebates, cost sharing for Firewise treatments, educational programs)?
- Are incentive programs being advertised and made widely available?
- What type of monitoring should be done within neighborhoods in the WUI to characterize fuel treatment effectiveness?
- Should there be well-publicized, visible indicators awarded to landowners for appropriately completed Firewise treatments (signage showing Firewise participation; the “red rock” or “green rock” in the driveway)?
- Is there a publicly accessible data base that shows the fuel conditions in the area?
- What capacity exists in the community to apply fuel treatments (number of wood chippers; contractors that do fuel reduction or prescribed burning work) or utilize common fuel treatment products (purchasers of chips or small roundwood)?
- Is there a spatial analysis of fire risk?
- Is there an inventory of housing unit risks?
- What is the distribution and status of “Firewise” treatments
- What are the prior stand-level fuel treatments?
- What is the distribution of fuel treatment opportunities?
- Is there a Community Wildfire Protection Plan?
- Are there Insurance-based cost-share opportunities as incentives for Firewise treatments?
- What is the local capacity for Firewise and fuel treatment – tools, markets, contractors?
- Are there good design criteria for new residential developments?

Pre Fire Event Assessment

☐ Pre Fire Certification and Shared Training Worksheet

- What types of fire fighters will be available locally?
- What skills/capabilities exist with other agencies in/near community or within community?
- What types of agreements (for example, MOU's) exist among the various fire-suppression and fuel treatment organizations in the vicinity?
- What is the status of a Community Wildfire Protection Plan?
- Is there a central database storage system and a responsible person for archiving Firewise treatments?
- What are the skills and availability of Forest Service personnel to manage monitoring data?
- What are reporting mechanisms that would allow for a critical evaluation of pre – and post fire management efforts (a template for an “audit” of event activities)?
- Is the adequate certification of locally available equipment for use?

Pre Fire Event Assessment

☐ Pre Fire Information Management Worksheet

- Are locations of residential dwellings, including new construction available?
- Are the cross-agency data standards for assessing fuels and risks?
- Is there interagency coordination capabilities and the willingness/capacity to archive, store, and manage monitoring data?

Pre Fire Event Assessment

- ☐ Pre Fire Coordination Planning Worksheet
 - Are there adequate MOU’s for coordinated actions?
 - Is there shared understanding of water sources?
 - Is there shared understanding of critical endangered species habitat?
 - Is there shared understanding of historical or cultural sites?

Pre Fire Event Assessment

- ☐ Pre Fire Identification of Community’s Key Stakeholders, local expertise, primary contacts, and spokespersons Worksheet

Pre Fire Event Assessment

- ☐ Pre Fire Monitor Of Community Change Worksheet
 - Have recent arrivals had opportunities for education?
 - Is there current mapping of roads that show potential bottlenecks during high volume and alternative evacuation routes?
 - Does planning for traffic management consider the impact of sharing roads with fire resources?
 - Are there rapidly changing, dynamic conditions across the community or in individual neighborhoods?
 - Is there a periodic audit of mitigation plans and actions?

Pre Fire Event Assessment

☐ Pre Fire Education Worksheet

- Is there an assessment of compatibility of fire management goals with community goals?
- Are the media and the public informed about the role of fire in the local ecosystem?
- Is there enough emphasize in the education program on personal responsibility of individual residents - self-preparedness, water, communications, Firewise treatments?

During Fire Event Monitoring

☐ During Fire Communications and Public Information Worksheet

- Are there frequent fire updates?
- Are we adequately telling the community where, when, and how?
- Is there a real-time web site with fire status and other information important to the local public?
- Is there an issue listening network that is able to respond to problems during the event?
- Are we maintaining good communications among agencies\
- Are we working with key community contacts?
- Are we reporting the fire status: perimeter, smoke, movement?
- Are we reporting the condition of homes/neighborhoods?

During Fire Event Monitoring

- ☐ During Fire Coordination of Operations Hand-Over Worksheet
 - Can we adequately address the community context of the fire?
 - Can we critique all the players in meeting or two?
 - Are Evacuations going ok?
 - Are the established communications ok?

During Fire Event Monitoring

☐ During Fire Assessment of Evacuations Worksheet

- What decision-making protocol is in place for evacuation?
- What is the availability of temporary shelters for people?
- What is the status of evacuation routes for major housing developments?
- What facilities or policies are in place to house livestock and pets?
- What communication tools or functions are in place regarding evacuation procedures, things to bring, keeping evacuees informed of the status of their property, and their potential return?
- Under what conditions can agency/sheriff’s office allow people back while evacuation is in effect to gather things, etc?
- What are relationships between agencies in conducting evacuations?
- In case of evacuation, how do we reach people who aren’t there?
- What are likely official and unofficial evacuation spots?
- How do we link people with resources after they return?
- What resources are available within/near community?
- Are the plans working?

During Fire Event Monitoring

- ☐ During Fire Coordination of Local Equipment and Labor Worksheet
- Is the public informed about contracting requirements, where to go, who to contact, what to expect?

Post Fire Event Evaluation

☐ Post Fire Communications Worksheet

- How do we let people know what’s going on with forest rehab, log salvage, etc.?
- Can we keep liaisons around after the fire?
- Do we conduct a community debriefing?
- Is there community participation in project decisions?

Post Fire Event Evaluation

☐ Post Fire Local Response and Rehabilitation Worksheet

- What roads and access opportunities are affected by rehabilitation efforts?
- What level of salvage logging can be feasible with exiting infrastructure and landscape-level demands for undisturbed, post-fire habitat?
- What utility lines, water systems, and other critical services must be addressed?
- Where are the watersheds that could be most threatening to residents if they become susceptible to extreme flooding events in the year after a fire?
- Have we identified sources of aid to the community for recovery?
- How do we link people with resources?
- What locally available skills are present to address watershed stabilization demands?
- Do we understand the economic impact of the fire to the community?

Post Fire Event Evaluation

☐ Post Fire Event Audit and Identification of Lessons Learned Worksheet

- Are we taking advantage of teachable moments?
- What is the single largest problem we had during the fire?
- Is there an audit of the operational aspects of the fire?
- How can we promote success of Firewise and fuels mitigation?
- Have we documented the effectiveness of fuels treatments on fire behavior?
- How do we monitor what we saved rather than what we lost?
- Are we preparing for the next event?
- Can we improve assignment of monitoring responsibilities to staff?
- Is there sufficient time and resources devoted to monitoring efforts?
- Is there a commitment to data analysis and archiving?
- What is the potential for monitoring information to catalyze change?

Post Fire Event Evaluation

☐ Post Fire Revision of Emergency Plan Worksheet

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RESOURCES

○ **National Firewise Communities Program**

www.firewise.org :

The national Firewise Communities program is a multi-agency effort designed to reach beyond the fire service by involving homeowners, community leaders, planners, developers, and others in the effort to protect people, property, and natural resources from the risk of wildland fire - before a fire starts. The Firewise Communities approach emphasizes community responsibility for planning in the design of a safe community as well as effective emergency response, and individual responsibility for safer home construction and design, landscaping, and maintenance.

The national Firewise Communities program is intended to serve as a resource for agencies, tribes, organizations, fire departments, and communities across the U.S. who are working toward a common goal: reduce loss of lives, property, and resources to wildland fire by building and maintaining communities in a way that is compatible with our natural surroundings.

Firewise Communities is part of the National Wildland/Urban Interface Fire Program, which is directed and sponsored by the Wildland/Urban Interface Working Team (WUIWT) of the National Wildfire Coordinating Group, a consortium of wildland fire organizations and federal agencies responsible for wildland fire management in the United States. The WUIWT includes: USDA Forest Service, USDI Bureau of Indian Affairs, USDI Bureau of Land Management, USDI Fish and Wildlife Service, USDI National Park Service, Federal Emergency Management Agency, US Fire Administration, International Association of Fire Chiefs, National Association of State Fire Marshals, National Association of State Foresters, National Emergency Management Association, National Fire Protection Association

○ **Firewise Conference**

The Firewise Communities program sponsors a conference on developing relationships across agencies and developing and working with Firewise communities. The second National Wildland / Urban Interface Fire Education Conference was held in Denver, CO November 2nd – 4th, 2006. Information on this conference can be found at the Firewise website: www.firewise.org.

○ The Wildland Fire Lessons Learned Center

The Lessons Learned Center is an interagency program supported by the National Wildfire Coordinating Group (NWCG) consisting of the federal and state fire agencies. The purpose of this center is to improve safe work performance through organizational learning in interagency wildland fire. The objectives are:

1. Improve Performance, Safety and Efficiency
2. Improve Organizational Learning
3. Share Knowledge
4. Promote Organizational Change

The Center's goal is to help the Wildland Fire Community become a learning organization. Becoming and sustaining the level of a learning organization inherently includes working safer, smarter and continuously improving. The Center's library contains thousands of reports and other documents sent in by wildland fire professionals from around the world. Much more is available at: www.wildfirelessons.net

○ Publications

Carroll, M. S., P. J. Cohn, D. N. Seesholtz, and L. Higgins. 2005. Fire as a galvanizing and fragmenting influence on communities: The case of the Rodeo-Chediski Fire. *Society and Natural Resources* 18(4):301–320.

Abstract: Large wildfires that burn through the “forest–residential intermix” are complex events with a variety of social impacts. This study looks at three northern Arizona community clusters directly affected by the 2002 Rodeo–Chediski fire. Our analysis suggests that the fire event led to both the emergence of cohesion and conflict in the study area. Community cohesion was evident as residents “pulled together” to rebuild their communities. Examples of cohesion included managers of local businesses staying during evacuation to provide for the needs of firefighters, providing shelter and cleanup help for burned-out neighbors, and the emergence of locally based assistance groups. Several types of conflict rooted in blaming and distribution of firefighting and disaster assistance resources were found: cultural, local versus federal, community versus community, intracommunity, and environmental. We suggest that these responses are most usefully understood using the lenses of social psychology (attribution theory) together with sociology (structuration theory). Issues and dynamics that resulted in controversy or were seen as locally constraining and those that resulted in cohesion tended to relate to specific local impacts and how outsider actions were either consonant or dissonant with the application of local knowledge, local autonomy, and locally desirable outcomes.

Carroll 2005.pdf

Cortner, H. J., Field, D. R., Jakes, P., Buthman, J. D. (2003). *Humans, fires, and forests - social science applied to fire management*. Flagstaff, AZ: Ecological Restoration Institute, Northern Arizona University, 111 p.

Abstract: The 2000 and 2002 fire seasons resulted in increased political scrutiny of the nation's wildland fire threats, and given the fact that millions of acres of lands are still at high risk for future catastrophic fire events, the issues highlighted by the recent fire seasons are not likely to go away any time soon. Recognizing the magnitude of the problem, the National Fire Plan outlined a cooperative long-term program of research and development to support efforts to reduce human and ecological losses from wildfire. For example, in Fiscal Year 2001, USDA Forest Service scientists received \$26 million for 63 research projects, including many projects that would apply the theories and methodologies of the social sciences to critical wildfire issues; an additional 15 projects were funded in Fiscal Year 2002. Forest Service scientists, in turn, brought in cooperators from universities and non-governmental organizations across the country to collaborate on projects focusing on issues related to firefighting, rehabilitation and restoration, hazardous fuel reduction, and community assistance. The large infusion of fire research dollars has provided the resources and incentives for social scientists to address questions of humans interactions with fire - pre, during and post fire events. Other activities in support of fire social science include the National Wildfire Coordinating Group's establishment of a social science research task group, and sponsorship of Burning Questions, a social science research agenda on fire (Machlis et al. 2002).

Cortner 2003.pdf

Jakes, P. J. (2003). Homeowners, communities, and wildfire; Science findings from the National Fire Plan. Proceedings of the Ninth International Symposium on Society and Management; 2002 June 2-5; Bloomington, Indiana. Gen. Tech. Rep. NC-231. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station, 92 p.

Abstract: A collection of papers presented at the Ninth International Symposium on Society and Resource Management highlight research findings from studies supported by the National Fire Plan. These studies focus on the human dimensions of wildfire, and look at the perceptions and actions of individuals, homeowners, and communities as they try to make sense of, live with, and be proactive about wildfire management,

Jakes 2003.pdf

Kumagai, Y., Carroll, M. S., and Cohn, P. J. (2004). Coping with interface wildfire as a human event: Lessons from the disaster/hazards literature. *Journal of Forestry*, 102(6), 28-32.

Abstract: The human community impacts of wildland fire is an understudied area. This article reviews the human disaster and hazards literature in an attempt to discover lessons applicable to understanding the social impacts of fire in the residential/wildland interface. It is argued that those literatures are potentially very useful in developing an understanding of wildland fire as a human event. A number of lessons are derived including why people tend to be unduly optimistic in the face of environmental hazards such as fire and why the characteristics of the affected community are at least as important as those of the fire in understanding social impacts.

[Kumagai 2004.pdf](#)

McCool, S. F., Burchfield, J. A., Williams, D. R., and Carroll, M. S. (2006). An event-based approach for examining the effects of wildland fire decisions on communities. *Environmental Management*, 37(4), 437-450.

Abstract: Public concern over the consequences of forest fire to wildland interface communities has led to increased resources devoted to fire suppression, fuel treatment, and management of fire events. The social consequences of the decisions involved in these and other fire-related actions are largely unknown, except in an anecdotal sense, but do occur at a variety of temporal and social organizational scales. These consequences are not limited to the fire event itself. Preparation for the possibility of a fire, actions that suppression agencies take during a fire, and postfire decisions all have consequences, if unknown currently. This article presents an "event-based" approach that can be useful for constructing and systematizing discussion about the consequences of wildland fire to human communities. For each of the three major periods within this approach, agencies, communities, and individuals make decisions and take actions that have consequences. The article presents an integrated, temporally based process for examining these consequences, which is similar to others developed in the natural hazards and disaster management literature.

[McCool 2006.pdf](#)

Steelman, T. A.; Kunkel, G. F. (2004). Effective community responses to wildfire threats: Lessons from New Mexico. *Society and Natural Resources*, 17, 679-699.

Abstract: National policies to address the wildfire threat in the United States place emphasis on community responsiveness, but great uncertainty surrounds the scope and success of community response to wildfire threats and why some communities foster effective responses while others fail to do so. Two case studies of community responses to wildfire threats in New Mexico are explored. A decision process framework illustrates how an effective response can be defined. Findings indicate that an effective community

response to wildfire means that a community works through all stages of the decision process with appropriate social and structural responses to its specific threat.

Keywords community response, decision process, New Mexico, Ruidoso, Santa Fe watershed, social response, structural response, wildfire threat

[Steelman 2004.pdf](#)

- **Agency Guidance**

The following link is to the Montana Interagency Coordination Guide for working with communities and private landowners before, during, and after wildfires. It includes tools for improved coordination among stakeholders. This is a set of appendices released in July 2004.

[Montana Interagency Guide Appendices.pdf](#)